



The Current Status of BSE and scrapie in Denmark

February 2010

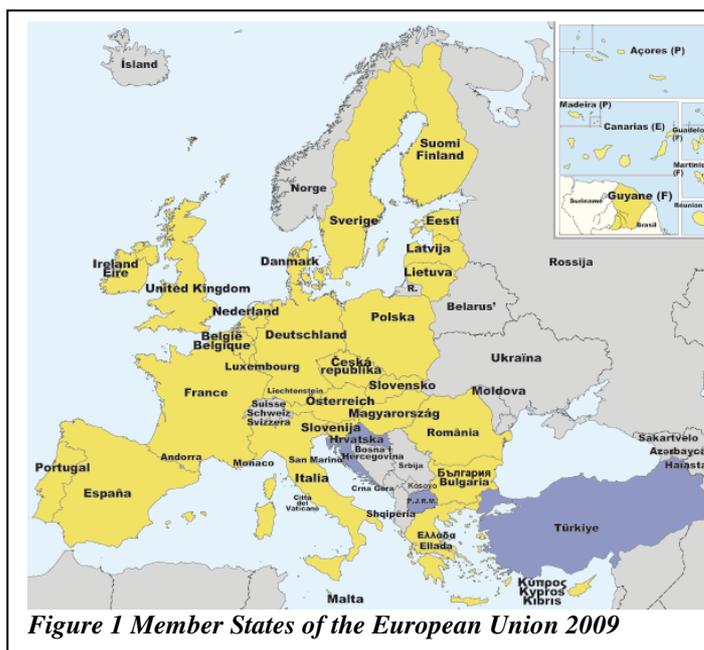
Introduction

Denmark is a low BSE incidence country based upon the results of the extensive active surveillance programme with more than 2 million tests performed over the last nine years.

The surveillance, prevention and control of BSE and other TSE's in The European Union is laid down in a common set of rules, which are valid for the whole of the EU. Before 1 January 2009, all risk animals above 24 months and all slaughter animals above 30 months were tested for BSE. After 1 January 2009, the age for testing was raised to 48 month for all risk animals and all slaughter animals in Denmark and a number of other EU-countries.

Preventive measures (i.e. feed bans) and passive surveillance have been implemented in all EU member states since 1990. They have gradually been strengthened since then according to scientific and epidemiological evidence in order to obtain the highest degree of consumer safety. The situation since 1 January 2001 has been a total ban of animal protein in feed for production animals and an active surveillance programme covering all categories of cattle above a defined age. Removal of specified risk material from all slaughter animals above a certain age has been implemented in Denmark since February 2000.

Denmark is placed in the category "Controlled BSE-risk" in the OIE categorisation system for BSE. However, in March 2010 it is more than 11 years ago since the birth of the last Danish case of BSE, and therefore Denmark can apply for the OIE category "Negligible BSE-risk". It is also evident that Denmark is a low incidence country regarding BSE compared to most other EU member states as documented by the results of the extensive surveillance programme carried out within the EU and summarized in this report. Furthermore, Denmark has consistently implemented the EU requirements for producing safe beef and beef products.



BSE in the EU

BSE has been diagnosed in many EU member states. The present prevention, surveillance and eradication measures of BSE and other TSE-diseases are laid down in the EU-regulation 999/2001, which came into force on the 1 July 2001 and is valid for the whole of the EU (see Figure 1).

The regulation is amended continuously according to results of the surveillance programme and new scientific knowledge about the epidemiology and pathogenesis of the disease.

BSE in Denmark

In Denmark, 15 cases of BSE have been found in Danish born cattle since February 2000. In addition, three BSE cases have been reported in Danish born cattle exported to other EU countries. Table 1 summarises data regarding these 18 BSE cases and Figure 2 shows their geographical distribution.

Case no.	Date of birth	Age in months	Surveillance category	Average age per year (months)	Year of diagnosis
1	1996-07-01	42	Clinical suspect	-	2000
2	1993-07-01	90	Fallen stock	62	2001
3	1997-02-08	48	Clinical suspect		
4	1996-02-23	65	Healthy slaughter		
5	1996-03-12	65	Fallen stock		
6	1996-06-25	64	Healthy slaughter		
7	1998-05-23	41	Healthy slaughter		
8	1996-06-17	70	Healthy slaughter		
9	1996-01-03	80	Fallen stock		
10	1998-12-08	46	Fallen stock		
Exp.(P ¹)	1999-03-15	39	Healthy slaughter		
Exp.(I ²)	1996-04-13	80	Healthy slaughter		
11	1997-08-25	67	Clinical suspect	76	2003
12	1996-03-01	84	Healthy slaughter		
Exp.(P ¹)	1996-12-19	78	Fallen stock		
13	1990	168	Fallen stock	-	2004
14	1996-03-01	113	Fallen stock	-	2005
15	1995-07-01	173	Healthy slaughter	-	2009

Table 1 BSE cases in Danish born cattle, P¹: Portugal. I²: Italy.

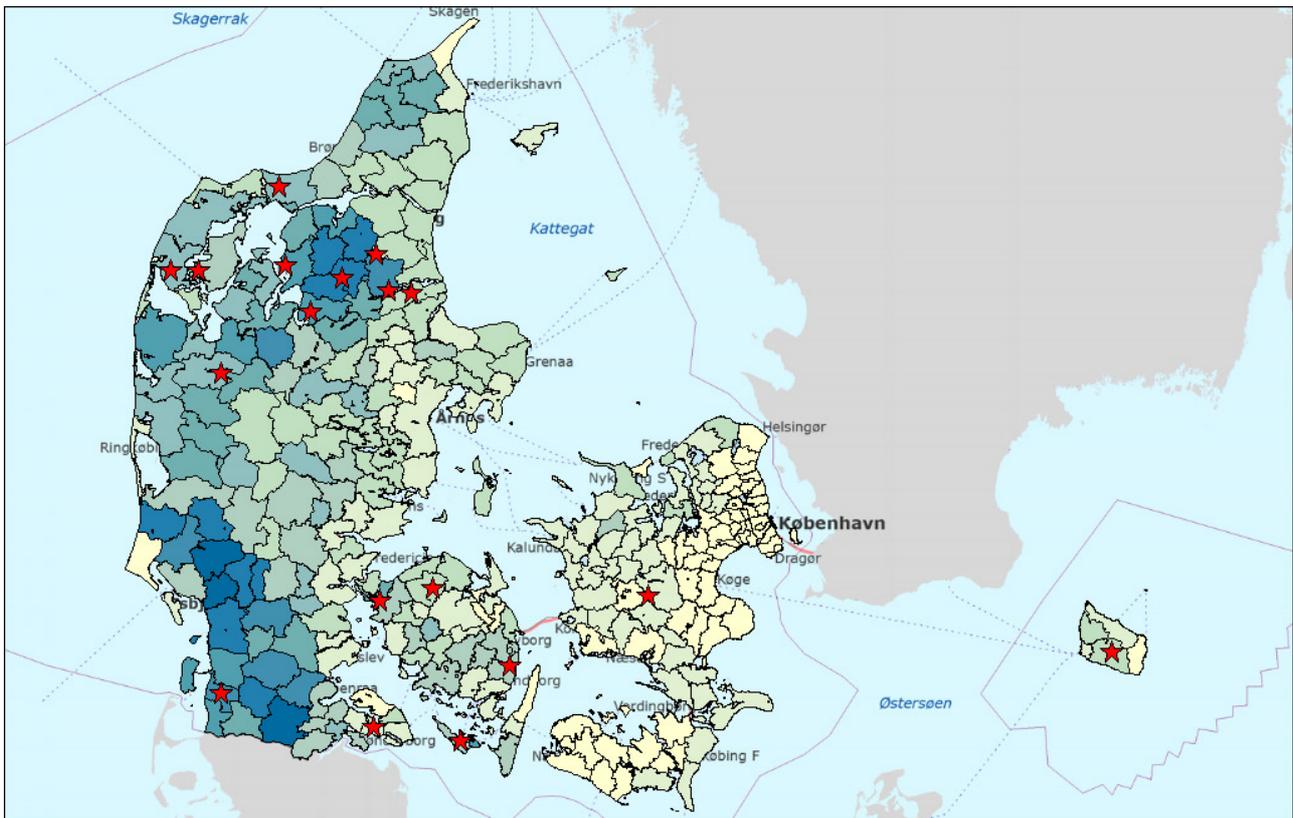


Figure 2 Geographic distributions of the 18 BSE cases found in Denmark since 2000

The EU-surveillance programme in Denmark

The active Danish surveillance programme started 1 October 2000 and included random sampling of risk animals and healthy slaughter animals. Testing of all healthy slaughter animals above the age of 30 months and all risk animals above the age of 24 months began 1 January 2001. This was changed 1 January 2009 due to changes in the EU-legislation to testing of all cattle above 48 months, regardless if it is a normal slaughter animal or a risk animal.

The programme is classified into active and passive surveillance as described in Table 2.

The passive surveillance started in 1990, when BSE was made notifiable. Every year 5-20 clinical suspects are tested for BSE (see Table 2)

ACTIVE SURVEILLANCE		PASSIVE SURVEILLANCE	
Category	Number per year	Category	Number per year
Fallen stock >48 months	23.000	Clinical suspects	5-20
UK-animals	0	-	-
Emergency slaughter animals >48 months	1.200	-	-
Ante mortem animals >48 months	3	-	-
Healthy slaughter animals >48 months	140.000	-	-

Table 2. Estimated number of BSE-tests pr. year in each category

Screening test samples are examined at one of three laboratories in Denmark approved to perform TSE tests. The laboratories are listed in Table 3. The applied tests are rapid tests approved by the EU.

The Danish Veterinary Institute (DVI) is part of the Technical University of Denmark (DTU). DVI is the Danish national reference laboratory and performs the confirmative testing in case of a positive or inconclusive rapid test. The additional two laboratories are private and are approved by The Danish Veterinary and Food Administration to perform rapid TSE tests for surveillance.

LABORATORIES	CATEGORY	APPLIED TEST	TEST MATERIAL
Danish Veterinary Institute	Risk animals	IDEXX Histopathology Immunohistochemistry	Brainstem
Eurofins Vejen	Healthy slaughter animals Risk animals	IDEXX	Brainstem
Danish Crown Laboratory	Healthy slaughter animals Risk animals	Prionics-Check PrioSTRIP	Brainstem

Table 3 Approved TSE laboratories in Denmark

Test sampling

Specially trained slaughterhouse personnel sample from healthy slaughter animals and risk animals at the slaughterhouse under supervision of the official meat inspectors. Test sampling from fallen stock is performed by regional veterinary officers.

Suspicion of BSE

In case of a positive or inconclusive result of the rapid test, BSE is suspected and test material is further investigated at the DVI using immunohistochemistry and histopathology or forwarded to the EU reference laboratory VLA in the UK.

Meanwhile, the herd of origin is placed under movement restrictions. This is also the case, when a clinical suspect is found, though the movement restrictions due to the clinical signs already applies before the result of the first test is available.

Additionally, if a rapid test of a slaughter animal is found positive; all parts of the animal are destroyed as SRM (see below) irrespective of the result of the verification test. The carcass of one animal before and two animals after the suspected animal at the slaughter line are also destroyed as SRM, if the final confirmative test is inconclusive or positive.

In case of a verification of the suspicion, the eradication programme is carried out – see the description below.

Results of the surveillance 2001-2009

The results of the surveillance programme 2001 – 2009 is summarised in Table 4. In this table, imported UK-animals and animals killed in BSE eradication are summarised in one column. In 2007, the last UK-animal imported before 1990 was killed and destroyed.

BSE-test										
Category	2001		2002		2003		2004		2005	
	Neg.	Pos.	Neg.	Pos.	Neg.	Pos.	Neg.	Pos.	Neg.	Pos.
Fallen stock	20.296	2	34.289	2	38.037	0	36.163	1	36.224	1
Emergency slaughter	1.797	0	1.680	0	1.682	0	1.803	0	2.024	0
AM-animals	99	0	24	0	16	0	7	0	9	0
Healthy slaughter animals	250.408	3	254.667	1	250.358	1	246.156	0	216.687	0
UK-animals, animals from BSE-pos herds	4.025	0	2.640	0	1.967	0	95	0	6	0
Clinical suspects	70	1	38	0	37	1	18	0	11	0
Total	276.695	6	293.338	3	292.097	2	284.242	1	254.961	1
	276.701		293.341		292.099		284.243		254.962	
Category	2006		2007		2008		2009		Total	
	Neg.	Pos.	Neg.	Pos.	Neg.	Pos.	Neg.	Pos.	Neg.	Pos.
Fallen stock	38.310	0	39.533	0	40.720	0	24.529	0	308.101	6
Emergency slaughter	1.747	0	1.553	0	1.612	0	552	0	14.450	0
AM-animals	5	0	4	0	3	0	9	0	176	0
Healthy slaughter animals	200.962	0	190.790	0	190.824	0	133.332	1	1.934.184	6
UK-animals, animals from BSE-pos herds	3	0	3	0	0	0	4	0	8.743	0
Clinical suspects	4	0	6	0	3	0	2	0	189	2
Total	241.031	0	231.889	0	233.124	0	158.428	1	2.265.843	14
	241.031		231.889		233.124		158.429		2.265.857	

*Classification in the category UK-animals etc. changed in 2004.

Table 4 The Danish BSE surveillance programme for cattle, 2001-2009.

Predictions 2009-2014

By using an epidemiological model and the results of the Danish BSE surveillance programme from 2001-2008, the Danish Veterinary Institute has prepared a prediction model for the expected number of BSE cases to be found in Denmark in the period 2009-2014 (Table 5). The current version of the model assumes a 100% effective feed ban as of January 2001, an assumption for which no validation data yet can be produced. According to the prediction, the eradication of BSE in Denmark is nearly accomplished.

Table 5 Expected numbers of BSE cases in 2009-2014.

	2009/2	2010	2011	2012	2013	2014/1	2009/2 – 2014/1
Positive cases in active surveillance (Upper 95% CL)*	0.00 (0.09)	0.00 (0.13)	0.00 (0.10)	0.00 (0.08)	0.00 (0.08)	0.00 (0.04)	0.00 (0.52)
Total cases (Upper 95% CL)	0.00 (0.12)	0.00 (0.16)	0.00 (0.12)	0.00 (0.10)	0.00 (0.09)	0.00 (0.05)	0.00 (0.66)

Prevention

Preventive measures before 2000

The first case of BSE in a Danish born cow was diagnosed in February 2000 and do not appear in Table 4, because it was diagnosed before the surveillance programme started. The following preventive measures were however already established in Denmark at the time:

- ❖ Ban on feeding ruminant MBM to ruminants 1990
- ❖ Import of cattle from the UK was stopped in 1990, now restricted to cattle born before the real UK-feed ban in 1996
- ❖ Individual monitoring of imported UK cattle imported before 1990 and exclusion of UK animals from the feed- and food chain as of mid 1996
- ❖ Ban on feeding mammalian MBM to ruminants as of January 1997
- ❖ Tightening of rules for separation of cattle feed from feed for other species from January 1997
- ❖ Tightening of rules for rendering of MBM from April 1997

Preventive measures after 2000

Immediately after finding the first BSE case in 2000, Denmark started the removal of specified risk material (SRM) from carcasses of slaughtered animals.

Removal of SRM, which was implemented in Denmark in February 2000, is the most important consumer protection factor. SRM is transported to the rendering plant for high-pressure sterilisation and subsequent incineration. SRM is not allowed to re-enter the food or feed chain.

The definition of SRM has been changed several times following the advances in scientific knowledge. In cattle, the following parts of the animal are defined as SRM:

Bovines of all ages:

- ❖ The intestines from the duodenum to the rectum
- ❖ The mesentery.
- ❖ The tonsils.

Bovines older than 12 months:

- ❖ The skull (excluding the lower jaw) including the brain and eyes.
- ❖ The spinal cord.

Bovines older than 30 month:

- ❖ The vertebral column excluding the vertebrae of the tail, the spinous and transverse processes of the cervical, thoracic and lumbar vertebrae and the median sacral crest and wings of the sacrum, but including the dorsal root ganglia

A further consumer protection was obtained through a ban on mechanically recovered meat (MRM) and a ban on pithing in connection with cattle slaughter.

In 2001, a total ban on the use of meat- and bone meal and fishmeal for feeding production animals was put into force in order to avoid any cross contamination from e.g. pig or poultry feed to ruminant feed. However, in 2008 the use of fish meal for unweaned ruminants was allowed, as there is no risk related to BSE from fishmeal.

Control

BSE-legislation

Denmark follows the TSE legislation laid down by the EU Commission in EU Regulation 999/2001 (as amended).

The eradication programme on herd level

According to the current EU-legislation, culling of the one-year birth cohort (culling of all cattle born in the herd of the index case one year on each side of the birth date of the index case) is the minimal measures, which must be taken. However, in Denmark, an extended birth cohort culling is used, where the length of the cohort period is made dependent upon the age of the index case. An older index case requires a wider cohort period, which reflects the higher uncertainty of the time of infection in an old index case.

Animals older than 24 months culled in connection with a positive BSE-case are tested for BSE prior to the incineration. So far, no animals have tested positive for BSE in this group in Denmark.

All animal waste from cattle (this includes the animals killed in the BSE eradication programme, SRM etc.) is processed as SRM at the rendering plant at high-pressure sterilisation using 133°C for 20 minutes at 3-bar pressure. The resulting fat and MBM is subsequently incinerated.

Future aspects of the Danish BSE surveillance

The Danish BSE surveillance will continue to be a top priority on a high level for the Danish Veterinary and Food Administration in order to take all precautions necessary to protect both national and international consumers against the potential health risk associated with bovine products.

Prionic diseases

BSE in cattle and humans

BSE belongs to the group of spongiform encephalopathies, which includes BSE, scrapie, Creutzfeldt-Jacobs disease and others. A malformed protein called resistant prion protein or PrP^{res} causes these diseases. The protein is able to change the conformation of normal (cellular) prion protein (PrP^c) to the resistant type with resulting accumulation and cell damage mainly in brain and other nerve tissue. BSE can be spread with animal protein in infected feed but cannot spread directly from animal to animal.

A new variety of the Creutzfeldt-Jacobs disease (vCJD) was discovered in the UK in 1996 causing illness in younger people characterised by a longer period of clinical symptoms than is normally seen in “classical” CJD.

Epidemiological and biochemical investigations, examinations of tissue samples and inoculation experiments have proven so many similarities between BSE in cattle and vCJD in humans, that it must now be considered for certain, that vCJD is caused by infection with BSE. The infection is most likely transmitted by meat products from cattle contaminated with infected tissue from brain, spinal cord and other nerve tissues. Milk and milk products are considered to be safe based upon several infection experiments in mice and cattle as well as from epidemiological evidence.

Deaths due to vCJD have been recorded in France, Italy, Hong Kong, USA, Canada, Japan, Ireland, The Netherlands and the UK. The vast majority of cases have been diagnosed in the UK (170 cases from definite or probable vCJD dead or alive as of February 2010).

Cases in Japan, Hong Kong, Canada and USA were found in persons, who had lived for a longer period in the UK. Cases in Italy and France have been found in persons both with and without a link to the UK.

According to the annual report (2009) from The National Creutzfeldt-Jakob Disease Surveillance Unit in the UK, the epidemic in the UK reached a peak of about 28 deaths in 2000 and has since declined to around two deaths each year. However, it is possible that there will be future peaks possibly in other genetic groups. There is also the possibility of ongoing person-to-person spread.

Due to the risk of spreading of vCJD among humans e.g. during surgery and blood donation and the remaining uncertainty regarding the disease, the importance of controlling BSE is evident.

Sheep and goats

The naturally occurring TSE in sheep and goat is scrapie, and this is not believed to threaten humans. As a consequence of the confirmation of BSE in a goat in France and the possible human health risk connected with this discovery, the EU has in a period in 2005 and 2006 adopted an extended surveillance programme for sheep and goats in the EU.

The Danish population of ovine and caprine consists of approximately 114.200 adult sheep and 15.700 adult goats (data from February 2010).

Cases of classical scrapie have never been diagnosed in Denmark, but in 2006-2008 five cases of atypical scrapie were found. Atypical scrapie differs from classical scrapie by distinct laboratory findings and by being less contagious (or not contagious at all) than classical scrapie. One of the hypotheses concerning atypical scrapie is that the disease is a spontaneous TSE, which is supported by the finding of normally one case in an old animal in each flock in question.

Surveillance of TSE in sheep and goats

- ❖ Scrapie was made notifiable 1988.
- ❖ Rules for identification and tracing of small ruminants through computerised files (CHR) were established in 1993 and tightened in 2002.
- ❖ A voluntary programme was introduced in 1995 using spot test surveillance of animals for import and export.
- ❖ A surveillance programme was laid down in 2002. The programme was based upon random sampling of fallen stock and slaughter animals above 18 months of age.
- ❖ From October 2003, the surveillance programme was extended to include all fallen stock above 18 months.
- ❖ From 1 January 2004, the surveillance of slaughter animals was stopped due to changes in the EU-regulation (Table 6).
- ❖ Surveillance of all caprine slaughter animals above 18 months. The surveillance began in September 2005 and ended in December 2006 due to changes in the EU-regulation.
- ❖ The surveillance of all ovine slaughter animals restarted in September 2006 and ended in December 2006 due to changes in the EU regulation.

ACTIVE SURVEILLANCE			PASSIVE SURVEILLANCE		
Category	Sheep/year	Goats/year	Category	Sheep/year	Goats/year
Fallen stock > 18 months	6.500	1.600	Clinical suspects	3	1

Table 6 Estimated number of TSE-tests pr. year in each category

Preventive measures for BSE in small ruminants

The preventive measures mentioned under the section for cattle (feed ban etc.) also apply for the small ruminants with regard to BSE.

Legislation on TSE in small ruminants

Denmark follows the TSE legislation laid down by the EU Commission in EU Regulation 999/2001 (as amended). Furthermore, the EU Commission has approved an extended surveillance programme for Denmark granting additional guarantees related to import of sheep and goats.

The extended programme includes testing of all fallen stock above 18 months and rules for import of live animals, semen, embryos and ova.

The results of the surveillance programme for 2002-2009

The results of the surveillance programme laid down by the EU Commission for sheep and goats are summarized in Table 7 and 8.

	2002		2003		2004		2005		2006		2007		2008		2009	
	Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos
Fallen stock	369	0	1.152	0	5.253	0	3.986	0	4.349	2	6.128	0	6.950	2	6.055	0
Healthy slaughter animals	563	0	880	0	91	0	60	0	3.695	1	67	0	0	0	0	0
Clinical suspects	6	0	3	0	5	0	0	0	3	0	1	0	0	0	0	0
Animals from pos. herds	0	0	0	0	0	0	0	0	17	0	168	0	0	0	0	0
Total	938	0	2.035	0	5.349	0	4.046	0	8.064	3	6.364	0	6.950	2	6.055	0

Table 7 The Danish TSE surveillance programme for sheep, 2002-2009

	2002		2003		2004		2005		2006		2007		2008		2009	
	Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos	Neg	Pos
Fallen stock	95	0	317	0	1.294	0	826	0	1.121	0	1.540	0	1.838	0	1.824	0
Healthy slaughter animals	51	0	94	0	26	0	241	0	594	0	24	0	0	0	0	0
Clinical suspects	4	0	3	0	0	0	3	0	1	0	0	0	0	0	3	0
Animals from pos. Herds	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	150	0	414	0	1.320	0	1.070	0	1.716	0	1.564	0	1.838	0	1.827	0

Table 8 The Danish TSE surveillance programme for goats, 2000-2009

Test sampling

An official veterinarian takes the samples from the fallen stock and the clinical suspects.

The Danish Veterinary Institute examines the samples from all the clinical suspects and a small number of the fallen stock, while the rest of the samples are examined at the private TSE laboratory, Eurofins.

Suspicion of scrapie in small ruminants

In case of a clinical suspect, the herd, where the animal is found, is put under official movement restriction, until the Danish Veterinary Institute has made further testing to confirm or deny the diagnosis. As mentioned above, classical scrapie has never been diagnosed in Denmark.

The contingency plans

Two contingency plans have been formulated; one considering a case of classical scrapie in small ruminants and one dealing with a case of BSE in small ruminants.

Contingency plan for classical scrapie

As opposed to BSE in cattle, classical scrapie in small ruminants can spread between animals in a herd. Therefore, the contingency plan is based upon removal of all animals in the herd and all contact animals and herds.

Concerning atypical scrapie, Denmark will follow the EU-regulation and derogate from the provisions for classic scrapie. The flock in question will be subject to intense surveillance for a period of two years and export from the flock will be prohibited for three years.

Contingency plan for BSE in small ruminants

In case of finding BSE in a sheep or goat, the measures for eradication of scrapie will apply for the holding of the infected animal and contact holdings. In addition, the use of products from sheep and goats for human consumption will be limited to sheep, which is genetically resistant or semiresistant to TSE and which is below 18 months for resistant animals and below six months for semiresistant animals. For these two categories, removal of defined SRM will guarantee the safety for the consumers.

Removal of SRM

The removal of SRM in small ruminants was implemented in Denmark in 2001 as a result of the TSE regulation 999/2001. SRM is treated as SRM from cattle with regard to transport, rendering and incineration (see above).

The definition of SRM has been changed several times following the advances in scientific knowledge. In small ruminants the following parts of the animals are defined as SRM:

Sheep and goats of all ages:

- ❖ The spleen.
- ❖ The ileum.

Sheep and goats older than 12 months:

- ❖ The skull including the brain and eyes.
- ❖ The tonsils.
- ❖ The spinal cord.

Future initiatives towards TSE in small ruminants

Should BSE in the future be found in small ruminants in Denmark, investigation into the matter of possible ways of securing a high degree of safety for the consumers will be performed.